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(54) Preparation of 1,2-diacyl-2-(*t*-alkyl)hydrazines.

(57) The present invention provides a process for preparing 1,2-diacyl-2-(*t*-alkyl)hydrazines. More particularly, the present invention provides a process for preparing the aforesaid diacylhydrazines utilizing a solvent comprising an ester or a mixture of an ester and water in a process wherein an aromatic acid chloride is reacted in a first step with a *t*-alkylhydrazine or a corresponding acid addition salt of a *t*-alkylhydrazine such as the hydrochloride salt in the presence of a base to afford a 1-acyl-2-*t*-alkylhydrazine followed by a second step wherein an aromatic acid chloride is reacted with the aforesaid monoacylhydrazine in the presence of a base to afford the desired 1,2-diacyl-2-(*t*-alkyl)hydrazine. Such compounds are known to have excellent insecticidal activity against insects of the orders Lepidoptera and Coleoptera.

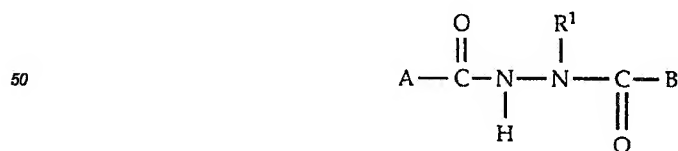
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The present invention is concerned with a process for preparing 1,2-diacyl-2-(*t*-alkyl)hydrazines. More particularly, the present invention is concerned with a process for preparing the aforesaid diacylhydrazines, utilizing a solvent comprising an ester or a mixture of an ester and water, and in which process an aromatic acid chloride is reacted in a first step with a *t*-alkylhydrazine or a corresponding acid addition salt of a *t*-alkylhydrazine such as the hydrochloride salt or the like in the presence of a base to afford a 1-acyl-2-*t*-alkylhydrazine followed by a second step wherein another aromatic acid chloride is reacted with the aforesaid monoacylhydrazine in the presence of a base to afford the desired 1,2-diacyl-2-(*t*-alkyl)hydrazine. Such compounds are known to have excellent insecticidal activity against insects of the orders Lepidoptera and Coleoptera.

The search for process solvents which are environmentally friendly, which are easily removed from the desired product, which provide good selectivity to the desired intermediates and products, which are easily recovered from the desired products, which allow a facile purification of the desired products, which possess favorable solubility properties for both the reactants and the desired intermediates and products, which can be used in all steps of the process, which are inert to the reaction conditions and which possess favorable process economics is a continuing one because of the difficulty in finding solvents or mixtures of solvents which fulfill all these important conditions. For example, US-A-4,985,461 discloses a process leading to 1,2-diacyl-2-(*t*-alkyl)hydrazines which employs one or more solvents such as water, alcohols such as methanol, ethanol, isopropanol and the like, hydrocarbons such as toluene, xylene, hexane, heptane and the like, glyme, tetrahydrofuran, acetonitrile, pyridine, haloalkanes such as methylene chloride or mixtures of these solvents. However, all these solvents suffer from one or more of the deficiencies previously noted. For example, water by itself results in poor intermediate and product yields and poor selectivity with a large amount of diacylation of the *t*-butylhydrazine occurring in the first process step. Alcohols such as methanol, ethanol, isopropanol and the like react with the acid chlorides, thus resulting in undesirable consumption of the acid chlorides and complicating the recovery and recycle of the process solvents. Hydrocarbons such as toluene, xylene, hexane, heptane and the like provide poor reaction selectivity in the first process step with resultant unacceptable levels of the wrong acylation isomer; additionally, these solvents are carefully regulated by governmental authorities because of environmental and safety concerns. Glyme and tetrahydrofuran are both ethers which can form undesirable levels of dangerous peroxides upon continued recovery and recycle to the process; they are also quite water soluble which further increases the difficulty of their recovery. Acetonitrile and pyridine not only are both very water soluble and hence difficult to recover in an aqueous system, but also both possess toxicological and safety concerns. Haloalkanes such as methylene chloride have a high vapor pressure which results in difficulty to contain and prevent emissions to the environment; the solubility of usual monoacylhydrazine intermediates and diacylhydrazine products is also usually very high in such solvents which results in problems to recover the aforesaid intermediates and products efficiently from such solvents.

It is, therefore, an aim of the present invention to provide a solvent which can be used in both steps of the process leading to 1,2-diacyl-2-(*t*-alkyl)hydrazines, which is environmentally friendly, which provides good selectivity, purities and yields for the aforesaid intermediates and products, which is easily recovered and recycled in the process, which allows facile removal of the product after completion of the reactions leading to it, which does not participate in the reaction process to provide undesirable side products, and which is economical to utilize. It has now unexpectedly been found that esters, more particularly aliphatic esters, possess these desirable attributes. Although US-A-4,985,461 teaches the use of the solvents listed previously, it does not teach or suggest the use of esters, with their attendant advantages, as solvents in a process to make 1,2-diacyl-2-(*t*-alkyl)hydrazines.

According to the present invention, there is provided a process, utilizing a solvent comprising an ester or a mixture of an ester and water, for the preparation at a temperature of from -20° C to 100° C of pesticidal 1,2-diacyl-2-(*t*-alkyl)hydrazine compounds of the formula



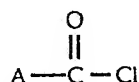
wherein

R<sup>1</sup> is a tertiary (C<sub>4</sub>-C<sub>8</sub>)alkyl group,

A and B are each independently (i) phenyl, (ii) naphthyl, or (iii) phenyl or naphthyl substituted with one to three of the same or different substituents selected from the group consisting of: halo; cyano; nitro; hydroxy;

mercapto; thiocyanato; (C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy; halo(C<sub>1</sub>-C<sub>2</sub>)alkyl; halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy; (C<sub>1</sub>-C<sub>4</sub>)alkylthio; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl; carboxy; formyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy; amino; (C<sub>1</sub>-C<sub>4</sub>)alkylamino; di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; carbamoyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl; di(C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl having independently the stated number of carbon atoms in each alkyl group; cyano(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>2</sub>-C<sub>6</sub>)alkenyl; (C<sub>4</sub>-C<sub>6</sub>)alkadienyl; (C<sub>2</sub>-C<sub>6</sub>)alkynyl; (C<sub>1</sub>-C<sub>4</sub>)alkyldithionate; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonylthio; tri(C<sub>1</sub>-C<sub>4</sub>)alkylsilyl having independently the stated number of carbon atoms in each alkyl group; phenyl; phenyl substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenoxy; phenoxy substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; benzoyl; benzoyl substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenoxycarbonyl; phenoxycarbonyl substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenylthio; phenylthio substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenyl(C<sub>1</sub>-C<sub>4</sub>)alkyl substituted on the phenyl ring with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfanyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; or when two adjacent positions on a phenyl ring are substituted with alkoxy groups, these groups may be joined to form a 5 or 6 membered dioxolano (methylenedioxy) or dioxano (1,2-ethylenedioxy) heterocyclic ring; and the agronomically acceptable salts thereof; whereby said process comprises:

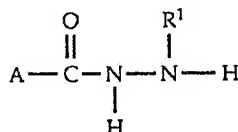
(a) reacting an aromatic acid chloride of the formula:



with a tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine of the formula:



or a corresponding acid addition salt of said tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine in the presence of a base, at a temperature of from -20°C to 40°C, to form an intermediate 1-acyl-2-(t-alkyl)hydrazine of the formula:



wherein A and R<sup>1</sup> have the same definitions as previously; and

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:



in the presence of a base, at a temperature of from 25°C to 100°C, to form the said 1,2-diacyl-2-(*t*-alkyl)hydrazine, wherein B has the same definitions as previously.

As used herein:-

Halo is chloro, fluoro, bromo or iodo;

(C<sub>1</sub>-C<sub>4</sub>)alkyl is a straight chain or branched chain alkyl group, for example, methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *t*-butyl;

Tertiary (C<sub>4</sub>-C<sub>8</sub>)alkyl is, for example, *t*-butyl, 1,1-dimethylpentyl or 1,1,3,3-tetramethylbutyl;

(C<sub>2</sub>-C<sub>6</sub>)alkenyl is, for example, vinyl, allyl or 2-buten-1-yl;

(C<sub>4</sub>-C<sub>6</sub>)alkadienyl is, for example, 2,4-pentadien-1-yl;

(C<sub>2</sub>-C<sub>6</sub>)alkynyl is, for example, propargyl;

(C<sub>1</sub>-C<sub>4</sub>)alkoxy is, for example, methoxy, ethoxy or isopropoxy;

(C<sub>1</sub>-C<sub>4</sub>)alkoxy(C<sub>1</sub>-C<sub>4</sub>)alkyl is, for example, methoxymethyl or 2-methoxyethyl;

Halo(C<sub>1</sub>-C<sub>2</sub>)alkyl is, for example, trifluoromethyl, 1,1,2,2,2-pentafluoroethyl or chloromethyl;

Halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy is, for example, difluoromethoxy;

(C<sub>1</sub>-C<sub>4</sub>)alkylthio is, for example, methylthio;

(C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl is, for example, methylcarbonyl(acetyl);

(C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl is, for example, ethoxycarbonyl;

(C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy is, for example, methylcarbonyloxy (acetoxy);

(C<sub>1</sub>-C<sub>4</sub>)alkylamino is, for example, isobutylamino;

Di(C<sub>1</sub>-C<sub>4</sub>)alkylamino is, for example, dimethylamino or N-methyl-N-ethylamino;

(C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl is, for example, *n*-butylcarbamoyl;

Di(C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl is, for example, dimethylcarbamoyl or N-methyl-N-ethylcarbamoyl;

(C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl is, for example, methylsulfinyl;

(C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl is, for example, methylsulfonyl;

(C<sub>1</sub>-C<sub>4</sub>)alkyldithionate is, for example, methyldithionate;

(C<sub>1</sub>-C<sub>4</sub>)alkylcarbonylthio is, for example, ethylcarbonylthio;

Tri(C<sub>1</sub>-C<sub>4</sub>)alkylsilyl is, for example, trimethylsilyl or diethylmethylsilyl;

Phenyl(C<sub>1</sub>-C<sub>4</sub>)alkyl is, for example, benzyl or 4-chlorophenethyl;

Methylenedioxy is the -OCH<sub>2</sub>O- moiety; and

1,2-Ethylenedioxy is the -OCH<sub>2</sub>CH<sub>2</sub>O- moiety.

Typical acid chlorides which may be used in the process of the present invention include, but are not limited to, benzoyl chloride, 3-methylbenzoyl chloride, 3,5-dimethylbenzoyl chloride, 3,5-dichlorobenzoyl chloride, 4-ethylbenzoyl chloride, 4-chlorobenzoyl chloride, 2-methyl-3-methoxybenzoyl chloride, 3,5-dichlorobenzoyl chloride, 3-chlorobenzoyl chloride, 4-cyanobenzoyl chloride, 3-nitrobenzoyl chloride, 2,3-dimethylbenzoyl chloride, 3-methoxybenzoyl chloride, 3-fluorobenzoyl chloride, 4-(*t*-butyl)benzoyl chloride, 2,4-dichlorobenzoyl chloride, 3-(trifluoromethyl)benzoyl chloride, 2-acetoxybenzoyl chloride, 4-(4-chlorophenethyl)benzoyl chloride, 1-naphthoyl chloride, 4-isopropylbenzoyl chloride, 2,6-difluorobenzoyl chloride, 2-(difluoromethoxy)benzoyl chloride, 4-acetylbenzoyl chloride, 3-(dimethylamino)benzoyl chloride, 2-nitro-4-((4-trifluoromethyl)-2-chlorophenoxy)benzoyl chloride, phenylthiobenzoyl chloride, 4-(2-fluorobenzyl)benzoyl chloride, 4-(4-chlorobenzoyl)benzoyl chloride, 4-(phenoxycarbonyl)benzoyl chloride, 2-methyl-3,4-(1,2-ethylenedioxy)benzoyl chloride, and 2-methyl-3,4-(methylenedioxy)benzoyl chloride.

Typical tertiary alkylhydrazines which may be used in the process of the present invention include, but are not limited to, *t*-butylhydrazine, 1,1-dimethylpentylhydrazine and 1,1,3,3-tetramethylbutylhydrazine, and their corresponding acid addition salts such as the hydrochloride salt, for example, *t*-butylhydrazine hydrochloride.

Typical 1,2-diacyl-2-(*t*-alkyl)hydrazine products which may be produced by the process of this invention include, but are not limited to, N'-*t*-butyl-N,N'-dibenzoylhydrazine, N'-*t*-butyl-N-(4-chlorobenzoyl)-N'-benzoylhydrazine, N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3-methylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-ethyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2,3-dimethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2,3-dimethylbenzoyl)-N'-(3-methylbenzoyl)hydrazine, N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dichlorobenzoyl)hydrazine, N'-*t*-butyl-N-(2-methyl-3,4-(1,2-ethyle-

nedioxy)benzol)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-methyl-3,4(methylenedioxy)benzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-fluorobenzoyl)-N'-benzoylhydrazine, N'-*t*-butyl-N-(1-naphthoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-(1,1-dimethylpentyl)-N-(4-chlorobenzoyl)-N'-benzoylhydrazine and N'-(1,1,3,3-tetramethylbutyl)-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine.

5 Preferably, 1,2-diacyl-2-(*t*-alkyl) hydrazine compounds, produced by the process of the present invention, are selected from the group consisting of:

N'-*t*-butyl-N,N'-dibenzoylhydrazine,

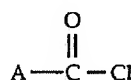
N'-*t*-butyl-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine,

N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine and

10 N'-*t*-butyl-N-(4-chlorobenzoyl)-N'-benzoylhydrazine

Typical esters which may be utilized as solvents or cosolvents with water in the process of this invention include, but are not limited to, (C<sub>1</sub>-C<sub>4</sub>)alkyl (C<sub>1</sub>-C<sub>6</sub>)alkanoates such as *n*-butyl acetate, methyl *n*-butyrate, ethyl isopropionate, *n*-propyl acetate, isopropyl acetate, ethyl acetate, methyl pentanoate, isobutyl acetate and ethyl *n*-butyrate.

15 In the process of the present invention, an aromatic acid chloride of the formula:



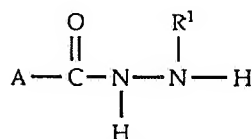
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is reacted with a tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine of the formula:



or a corresponding acid addition salt of the tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine in the presence of a base in a solvent comprising an ester or a mixture of water and an ester to form an intermediate 1-acyl-2-(*t*-alkyl)hydrazine of the formula:

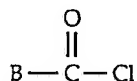
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wherein A and R<sup>1</sup> have the same definitions as previously; and then reacting the intermediate hydrazine with an aromatic acid chloride of the formula:

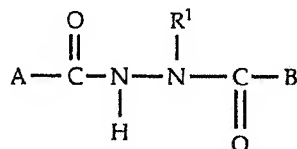
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in the presence of a base and solvent comprising the same ester or a mixture of water and the same ester to form the desired 1,2-diacyl-2-(*t*-alkyl)hydrazine product having the formula:

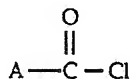
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wherein A, B and R<sup>1</sup> are the same as defined previously. When A and B are the same, for example, both A and B are 4-chlorophenyl, two equivalents of the aromatic acid chloride of the formula:

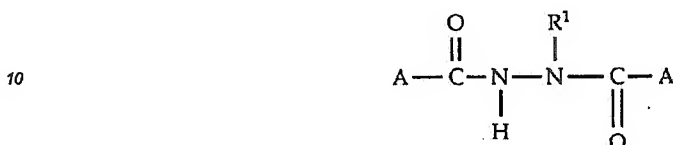
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may be reacted with a tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine of the formula:



or a corresponding acid addition salt of the tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine in the presence of a base in a solvent comprising an ester or a mixture of water and an ester solvent to form the desired 1,2-diacyl-2-(*t*-alkyl)hydrazine product having the formula:



wherein A and R<sup>1</sup> are the same as defined previously.

Examples of bases for use in the process of the present invention include, but are not limited to, tertiary amines such as triethylamine, pyridine, potassium carbonate, sodium carbonate, sodium bicarbonate, potassium bicarbonate, sodium hydroxide, potassium hydroxide, or mixtures thereof.

The process of the present invention can be carried out at temperatures of from -20° C to 100° C at about atmospheric pressure, although higher or lower pressures can be used if desired. More specifically, the temperatures utilized in the first step (step a) of the present process are in the range of from -20° C to 40° C, and the temperatures utilized in the second step (step b) of the present process are in the range of from 25° C to 100° C.

Typically, substantially equimolar amounts of reactants are used in the process although higher or lower amounts can be used if desired. Generally, from about 1.0 to about 1.5 equivalents of base are used per equivalent of the aromatic acid chloride starting material. When an acid addition salt of the tertiary alkylhydrazine is employed, one additional equivalent of base is typically employed.

Modifications to the process of the present invention may be necessary to accommodate reactive functionalities of particular A and/or B substituents. Such modifications would be apparent and known to those skilled in the art. Procedures for making the agronomically acceptable salts embraced by the products resulting from the process of the present invention are also well known to those skilled in the art and have been previously described in the literature, e.g. in US-A-4,985,461.

In a preferred embodiment of the present invention, there is provided a process, utilizing a solvent comprising a (C<sub>2</sub>-C<sub>4</sub>)alkyl (C<sub>2</sub>-C<sub>6</sub>)alkanoate ester or a mixture of a (C<sub>2</sub>-C<sub>4</sub>)alkyl (C<sub>2</sub>-C<sub>6</sub>)alkanoate ester and water for the preparation of 1,2-diacyl-2-(*t*-alkyl)hydrazine compounds of the formula:



wherein:

R<sup>1</sup> is *t*-butyl, 1,1-dimethylpentyl or 1,1,3,3-tetramethylbutyl;

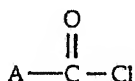
A and B are each independently (i) phenyl, (ii) naphthyl, or (iii) phenyl or naphthyl substituted with one to three of the same or different substituents selected from the group consisting of: halo; cyano; nitro; thiocyanato; (C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy; halo(C<sub>1</sub>-C<sub>2</sub>)alkyl; halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy; (C<sub>1</sub>-C<sub>4</sub>)alkylthio; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl; carboxy; formyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy; di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; carbamoyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl; di(C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl having independently the stated number of carbon atoms in each alkyl group; cyano(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>2</sub>-C<sub>6</sub>)alkenyl; (C<sub>4</sub>-C<sub>6</sub>)alkadienyl; (C<sub>2</sub>-C<sub>6</sub>)alkynyl; (C<sub>1</sub>-C<sub>4</sub>)alkyldithionate; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonylthio; tri(C<sub>1</sub>-C<sub>4</sub>)alkylsilyl having independently the stated number of carbon atoms in each alkyl group; phenyl; phenoxy; benzoyl; phenyl(C<sub>1</sub>-C<sub>2</sub>)alkyl or phenyl(C<sub>1</sub>-C<sub>2</sub>)alkyl substituted on the phenyl ring with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl

group; or when two adjacent positions on a phenyl ring are substituted with alkoxy groups, these groups may be joined to form a 5 or 6 membered dioxolano or dioxano heterocyclic ring; and

the agronomically acceptable salts thereof;

whereby said process comprises:

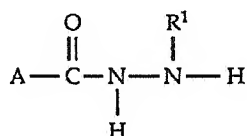
5 (a) reacting an aromatic acid chloride of the formula:



10

with *t*-butylhydrazine, 1,1-dimethylpentylhydrazine or 1,1,3,3-tetramethylbutylhydrazine or a corresponding acid addition salt of said hydrazine in the presence of potassium hydroxide, sodium hydroxide, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate or a mixture thereof at a temperature from -5° C to 40° C to form an intermediate 1-acyl-2-(*t*-alkyl)hydrazine of the formula:

15

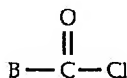


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wherein A and R<sup>1</sup> have the same definitions as previously; and

25

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:



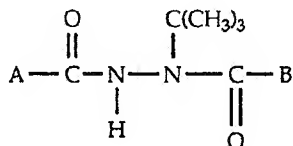
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in the presence of potassium hydroxide, sodium hydroxide, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate or a mixture thereof at a temperature of from 25° C to 95° C to form the said 1,2-diacyl-2-(*t*-alkyl)hydrazine, wherein B has the same definitions as previously.

35

In a more preferred embodiment of the present invention, there is provided a process, utilizing a solvent comprising a mixture of water and an ester selected from the group consisting of isobutyl acetate, ethyl acetate, isopropyl acetate and *n*-butyl acetate, for the preparation of 1,2-diacyl-2-(*t*-butyl)hydrazine compounds of the formula:

40



45

wherein:

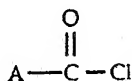
A and B are each independently phenyl, or phenyl substituted with one to three of the same or different substituents selected from the group consisting of halo, (C<sub>1</sub>-C<sub>2</sub>)alkyl, (C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>2</sub>)alkoxy(C<sub>1</sub>-C<sub>2</sub>)alkyl, or when two adjacent positions on a phenyl ring are substituted with alkoxy groups, these groups may be joined to form a 5 or 6 membered dioxolano or dioxano heterocyclic ring;

50

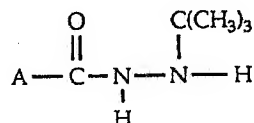
whereby said process comprises:

(a) reacting an aromatic acid chloride of the formula:

55

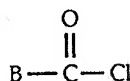


with *t*-butylhydrazine or *t*-butylhydrazine hydrochloride in the presence of potassium hydroxide, sodium hydroxide, sodium carbonate, sodium bicarbonate, potassium carbonate, or a mixture thereof to form an intermediate 1-acyl-2-(*t*-butyl)hydrazine of the formula:



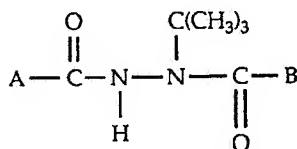
wherein A has the same definitions as previously; and

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:



in the presence of sodium carbonate, sodium bicarbonate or potassium carbonate or a mixture thereof to form the said 1,2-diacyl-2-(*t*-butyl)hydrazine, wherein B has the same definitions as previously.

In a most preferred embodiment of the present invention, there is provided a process, utilizing a solvent comprising a mixture of water and *n*-butyl acetate as solvent, for the preparation of 1,2-diacyl-2-(*t*-butyl)hydrazine compounds of the formula:



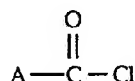
wherein:

A is phenyl, 2-fluorophenyl, 4-chlorophenyl, 2-methyl-3-methoxyphenyl or 4-ethylphenyl;

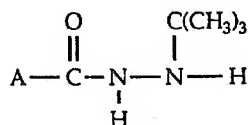
B is phenyl, 3,5-dimethylphenyl, 3-methylphenyl, 3-chlorophenyl or 3,5-dichlorophenyl;

whereby said process comprises:

(a) reacting an aromatic acid chloride of the formula:



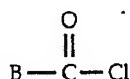
with *t*-butylhydrazine hydrochloride in the presence of a mixture of sodium hydroxide and potassium carbonate to form an intermediate 1-acyl-2-(*t*-butyl)hydrazine of the formula:



wherein A has the same definitions as previously; and

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:





5 in the presence of sodium carbonate or potassium carbonate to form the said 1,2-diacyl-2-(*t*-butyl)hydrazine, wherein B has the same definitions as previously.

The following Examples are presented to illustrate various embodiments of the process of the present invention.

10 **EXAMPLE 1: PREPARATION OF N'-*t*-BUTYL-N-(4-ETHYLBENZOYL)-N'-(3,5-DIMETHYLBENZOYL)HYDRAZINE**

**STEP A:**

15 To a flask inerted with nitrogen was added 65.4 grams (g) of *t*-butylhydrazine hydrochloride and 50 g of water. The temperature was maintained at 20° C or lower as 78.8 g of 20% sodium hydroxide solution was charged while stirring the flask contents. This was followed by the addition of a solution of 36.2 g of potassium carbonate in 50 g of water. The reaction mixture was cooled to 15° C and 300 g of *n*-butyl acetate was added. While continuing stirring at 15° C, 84.3 g of 4-ethylbenzoyl chloride and 100g of 20% sodium hydroxide solution  
20 were cofed to the reaction mixture over a one hour period. The resulting slurry was held an additional 30 minutes at 15° C and was then heated to 40° C. The solids dissolved and the aqueous phase was removed. The *n*-butyl acetate phase was washed with 100 g of water and the wash discarded.

**STEP B:**

25 To the *n*-butyl acetate phase was added 100 g of water and the resulting mixture was heated to 60° C. An aqueous potassium carbonate solution, which was prepared from 37.3 g of anhydrous potassium carbonate, and 84.3 g of 3,5-dimethylbenzoyl chloride were cofed to the stirred reaction mixture. When the feeds were 50% complete, the reaction mixture was seeded with 0.18 g of N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine. After the appearance of solids, the feeds were resumed. After completion of the feeds, the  
30 reaction mixture was stirred an additional hour at 60° C and then the phases were allowed to settle. The aqueous phase was discarded and the slurry was washed twice with 100 g portions of water at 60° C and then cooled to 5° C. The solids were filtered, washed with cold *n*-butyl acetate and then dried under vacuum resulting in the recovery of N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine as white solid of 96.5% purity.  
35

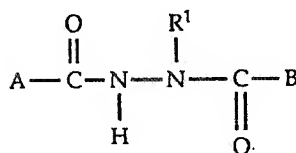
**EXAMPLES 2-5:**

40 By following substantially the same procedure as Example 1 and utilizing the aromatic acid chlorides listed for the steps as shown, the following compounds may be prepared as further illustrations of the process of this invention:

EX. NO.	STEP A	STEP B	PRODUCT
45 2	benzoyl	benzoyl	N'- <i>t</i> -butyl-N,N'-dibenzoylhydrazine
3	2-fluorobenzoyl	benzoyl	N'- <i>t</i> -butyl-N-(2-fluorobenzoyl)-N'-benzoylhydrazine
50 4	4-chlorobenzoyl	benzoyl	N'- <i>t</i> -butyl-N-(4-chlorobenzoyl)-N'-benzoylhydrazine
55 5	2-methyl-3-methoxybenzoyl	3,5-dimethylbenzoyl	N'- <i>t</i> -butyl-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine

## Claims

1. A process, utilizing a solvent comprising an ester or a mixture of an ester and water, for the preparation of pesticidal 1,2-diacyl-2-(*t*-alkyl)hydrazine compounds of the formula:



wherein:

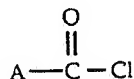
R<sup>1</sup> is a tertiary (C<sub>4</sub>-C<sub>8</sub>)alkyl group;

A and B are each independently (i) phenyl, (ii) naphthyl, or (iii) phenyl or naphthyl substituted with one to three of the same or different substituents selected from the group consisting of: halo; cyano; nitro; hydroxy; mercapto; thiocyanato; (C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy; halo(C<sub>1</sub>-C<sub>2</sub>)alkyl; halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy; (C<sub>1</sub>-C<sub>4</sub>)alkylthio; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl; carboxy; formyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy; amino; (C<sub>1</sub>-C<sub>4</sub>)alkylamino; di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; carbamoyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl; di(C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl having independently the stated number of carbon atoms in each alkyl group; cyano(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>2</sub>-C<sub>6</sub>)alkenyl; (C<sub>4</sub>-C<sub>6</sub>)alkadienyl; (C<sub>2</sub>-C<sub>6</sub>)alkynyl; (C<sub>1</sub>-C<sub>4</sub>)alkyldithionate; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonylthio; tri(C<sub>1</sub>-C<sub>4</sub>)alkylsilyl having independently the stated number of carbon atoms in each alkyl group; phenyl; phenyl substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenoxy; phenoxy substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; benzoyl; benzoyl substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenoxycarbonyl; phenoxycarbonyl substituted with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; phenyl(C<sub>1</sub>-C<sub>4</sub>)alkyl; phenyl(C<sub>1</sub>-C<sub>4</sub>)alkyl substituted on the phenyl ring with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, amino, (C<sub>1</sub>-C<sub>4</sub>)alkylamino, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; or when two adjacent positions on a phenyl ring are substituted with alkoxy groups, these groups may be joined to form a 5 or 6 membered dioxolano (methylenedioxy) or dioxano (1,2-ethylenedioxy) heterocyclic ring;

or the agronomically acceptable salts thereof;

whereby said process comprises:

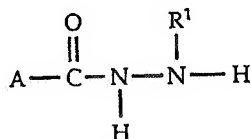
- (a) reacting an aromatic acid chloride of the formula:



with a tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine of the formula:

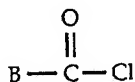


or a corresponding acid addition salt of said tertiary (C<sub>4</sub>-C<sub>8</sub>)alkylhydrazine in the presence of a base, at a temperature of from -20° C to 40° C, to form an intermediate 1-acyl-2-(*t*-alkyl)hydrazine of the formula:



wherein A and R<sup>1</sup> have the same definitions as previously; and

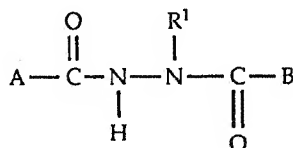
(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:



in the presence of a base, at a temperature of from 25° C to 100° C, to form the said 1,2-diacyl-2-(*t*-alkyl)hydrazine, wherein B has the same definitions as previously.

2. A process as claimed in claim 1, wherein the acid chloride, used in step (a) and/or step (b), is selected from: benzoyl chloride, 3-methylbenzoyl chloride, 3,5-dimethylbenzoyl chloride, 3,5-dichlorobenzoyl chloride, 4-ethylbenzoyl chloride, 4-chlorobenzoyl chloride, 2-methyl-3-methoxybenzoyl chloride, 3,5-dichlorobenzoyl chloride, 3-chlorobenzoyl chloride, 4-cyanobenzoyl chloride, 3-nitrobenzoyl chloride, 2,3-dimethylbenzoyl chloride, 2-methoxybenzoyl chloride, 3-fluorobenzoyl chloride, 4-(*t*-butyl)benzoyl chloride, 2,4-dichlorobenzoyl chloride, 3-(trifluoromethyl)benzoyl chloride, 2-acetoxybenzoyl chloride, 4-(4-chlorophenethyl)benzoyl chloride, 1-naphthoyl chloride, 4-isopropylbenzoyl chloride, 2,6-difluorobenzoyl chloride, 2-(difluoromethoxy)benzoyl chloride, 4-acetylbenzoyl chloride, 3-(dimethylamino)benzoyl chloride, 2-nitro-4-((4-trifluoromethyl)-2-chlorophenoxy)benzoyl chloride, phenylthiobenzoyl chloride, 4-(2-fluorobenzyl)benzoyl chloride, 4-(4-chlorobenzoyl) chloride, 4-(phenoxy-carbonyl)benzoyl chloride, 2-methyl-3,4-(1,2-ethylenedioxy)benzoyl chloride and 2-methyl-3,4-(methylenedioxy)benzoyl chloride.
3. A process as claimed in claim 1 or claim 2, wherein the tertiary (C<sub>4</sub>-C<sub>8</sub>) alkylhydrazine, used in step (a) is selected from: *t*-butylhydrazine, 1,1-dimethylpentylhydrazine and 1,1,3,3-tetramethylbutylhydrazine, and their corresponding acid addition salts.
4. A process as claimed in claim 1, wherein the 1,2-diacyl-2-(*t*-alkyl) hydrazine is selected from: N'-*t*-butyl-N,N'-dibenzoylhydrazine, N'-*t*-butyl-N-(4-chlorobenzoyl)-N'-benzoylhydrazine, N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3-methylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-ethyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2,3-dimethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2,3-dimethylbenzoyl)-N'-(3-methylbenzoyl)hydrazine, N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dichlorobenzoyl)hydrazine, N'-*t*-butyl-N-(2-methyl-3,4-1,2-ethylenedioxy)benzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-methyl-3,4-(methylenedioxy)benzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-*t*-butyl-N-(2-fluorobenzoyl)-N'-benzoylhydrazine, N'-*t*-butyl-N-(1-naphthoyl)-N'-(3,5-dimethylbenzoyl)hydrazine, N'-(1,1-dimethylpentyl)-N-(4-chlorobenzoyl)-N'-benzoylhydrazine and N'-(1,1,3,3-tetramethylbutyl)-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine.

5. A process as claimed in claim 1, utilizing a solvent comprising a (C<sub>2</sub>-C<sub>4</sub>)alkyl (C<sub>2</sub>-C<sub>6</sub>)alkanoate ester or a mixture of a (C<sub>2</sub>-C<sub>4</sub>)alkyl (C<sub>2</sub>-C<sub>6</sub>)alkanoate ester and water, for the preparation of 1,2-diacyl-2-(*t*-alkyl)hydrazine compounds of the formula:



wherein:

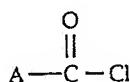
R<sup>1</sup> is *t*-butyl, 1,1-dimethylpentyl or 1,1,3,3-tetramethylbutyl;

A and B are each independently (i) phenyl, (ii) naphthyl, or (iii) phenyl or naphthyl substituted with one to three of the same or different substituents selected from the group consisting of: halo; cyano; nitro; thiocyanato; (C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy; halo(C<sub>1</sub>-C<sub>2</sub>)alkyl; halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy; (C<sub>1</sub>-C<sub>4</sub>)alkylthio; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl; (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl; carboxy; formyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl; (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy; di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; carbamoyl; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl; di(C<sub>1</sub>-C<sub>4</sub>)alkylcarbamoyl having independently the stated number of carbon atoms in each alkyl group; cyano(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>1</sub>-C<sub>4</sub>)alkoxy(C<sub>1</sub>-C<sub>4</sub>)alkyl; (C<sub>2</sub>-C<sub>6</sub>)alkenyl; (C<sub>4</sub>-C<sub>6</sub>)alkadienyl; (C<sub>2</sub>-C<sub>6</sub>)alkynyl; (C<sub>1</sub>-C<sub>4</sub>)alkyldithionate; (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonylthio; tri(C<sub>1</sub>-C<sub>4</sub>)alkylsilyl having independently the stated number of carbon atoms in each alkyl group; phenyl; phenoxy; benzoyl; phenyl(C<sub>1</sub>-C<sub>2</sub>)alkyl; or phenyl(C<sub>1</sub>-C<sub>2</sub>)alkyl substituted on the phenyl ring with one to two of the same or different substituents selected from the group consisting of halo, cyano, nitro, hydroxy, (C<sub>1</sub>-C<sub>4</sub>)alkyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxy, halo(C<sub>1</sub>-C<sub>2</sub>)alkyl, halo(C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>4</sub>)alkylthio, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfinyl, (C<sub>1</sub>-C<sub>4</sub>)alkylsulfonyl, carboxy, formyl, (C<sub>1</sub>-C<sub>4</sub>)alkylcarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkoxycarbonyl, (C<sub>1</sub>-C<sub>4</sub>)alkanoyloxy, di(C<sub>1</sub>-C<sub>4</sub>)alkylamino having independently the stated number of carbon atoms in each alkyl group; or when two adjacent positions on a phenyl ring are substituted with alkoxy groups, these groups may be joined to form a 5 or 6 membered dioxolano or dioxano heterocyclic ring;

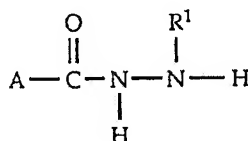
or the agronomically acceptable salts thereof;

whereby said process comprises:

(a) reacting an aromatic acid chloride of the formula:

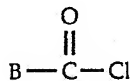


with *t*-butylhydrazine, 1,1-dimethylpentylhydrazine or 1,1,3,3-tetramethylbutylhydrazine or a corresponding acid addition salt of said hydrazine in the presence of potassium hydroxide, sodium hydroxide, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate or a mixture thereof at a temperature of from -5° C to 40° C to form an intermediate 1-acyl-2-(*t*-alkyl)hydrazine of the formula:



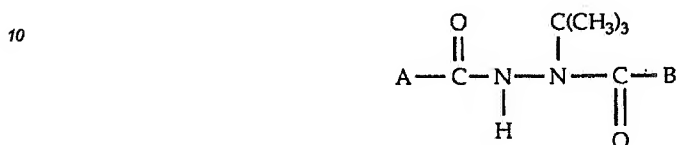
wherein A and R<sup>1</sup> have the same definitions as previously; and

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:



in the presence of potassium hydroxide, sodium hydroxide, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate or a mixture thereof at a temperature of from 25° C to 95° C to form the said 1,2-diacyl-2-(*t*-alkyl)hydrazine, wherein B has the same definitions as previously.

- 5 6. A process as claimed in claim 5, utilizing a solvent comprising a mixture of water and an ester selected from the group consisting of isobutyl acetate, ethyl acetate, isopropyl acetate and *n*-butyl acetate, for the preparation of 1,2-diacyl-2-(*t*-butyl)hydrazine compounds of the formula:



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wherein:

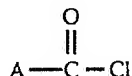
A and B are each independently phenyl, or phenyl substituted with one to three of the same or different substituents selected from the group consisting of halo, (C<sub>1</sub>-C<sub>2</sub>)alkyl, (C<sub>1</sub>-C<sub>2</sub>)alkoxy, (C<sub>1</sub>-C<sub>2</sub>)alkoxy(C<sub>1</sub>-C<sub>2</sub>)alkyl, or when two adjacent positions on a phenyl ring are substituted with alkoxy groups, these groups may be joined to form a 5 or 6 membered dioxolano or dioxano heterocyclic ring;

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whereby said process comprises:

(a) reacting an aromatic acid chloride of the formula:

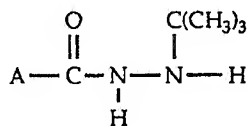
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with *t*-butylhydrazine or *t*-butylhydrazine hydrochloride in the presence of potassium hydroxide, sodium hydroxide, sodium carbonate, sodium bicarbonate, potassium carbonate, or a mixture thereof to form an intermediate 1-acyl-2-(*t*-butyl)hydrazine of the formula:

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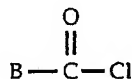


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wherein A has the same definitions as previously; and

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:

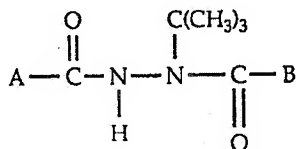
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in the presence of sodium carbonate, sodium bicarbonate, potassium carbonate or a mixture thereof to form the said 1,2-diacyl-2-(*t*-butyl)hydrazine, wherein B has the same definitions as previously.

- 50 7. A process as claimed in claim 6, utilizing a solvent comprising a mixture of water and *n*-butyl acetate, for the preparation of 1,2-diacyl-2-(*t*-butyl)hydrazine compounds of the formula:

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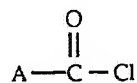
wherein:

A is phenyl, 2-fluorophenyl, 4-chlorophenyl, 2-methyl-3-methoxyphenyl or 4-ethylphenyl;

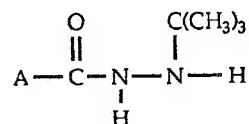
B is phenyl, 3,5-dimethylphenyl, 3-methylphenyl, 3-chlorophenyl or 3,5-dichlorophenyl;

whereby said process comprises:

(a) reacting an aromatic acid chloride of the formula:

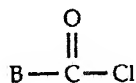


with *t*-butylhydrazine hydrochloride in the presence of a mixture of sodium hydroxide and potassium carbonate to form an intermediate 1-acyl-2-(*t*-butyl)hydrazine of the formula:



wherein A has the same definitions as previously; and

(b) reacting said intermediate hydrazine from step (a) with an aromatic acid chloride of the formula:



in the presence of sodium carbonate or potassium carbonate to form the said 1,2-diacyl-2-(*t*-butyl)hydrazine, wherein B has the same definitions as previously.

8. A process as claimed in claim 7, wherein the 1,2-diacyl-2-(*t*-butyl) hydrazine is selected from the group consisting of:

N'-*t*-butyl-N,N'-dibenzoylhydrazine,

N'-*t*-butyl-N-(2-methyl-3-methoxybenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine,

N'-*t*-butyl-N-(4-ethylbenzoyl)-N'-(3,5-dimethylbenzoyl)hydrazine and

N'-*t*-butyl-N-(4-chlorobenzoyl)-N'-benzoylhydrazine

9. Use, as a pesticide, of a 1,2-diacyl-2-(*t*-alkyl) hydrazine prepared by a process as claimed in any preceding claim.



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 94 30 5803

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,X	EP-A-0 236 618 (ROHM AND HAAS COMPANY) * claims; examples *	9	C07C243/38
D,A	* page 22, line 8 - line 13 * ----	1-8	
A	EP-A-0 492 839 (ROHM AND HAAS COMPANY) * page 2, line 50 - line 52; claims; examples * -----	1-8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			C07C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		2 November 1994	Helps, I
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  .....  &amp; : member of the same patent family, corresponding document</p>			

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